The Impact of Remittances on Fertility Rate in Pakistan: New Evidence from ARDL Cointegration

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A B S T R A C T

This study examines the long-term and short-term relationship between worker remittances and fertility rates by applying ARDL and ECM. Two key pathways through which the transfer of remittances affects the fertility rate are identified. In the first place, migrants tend to adopt the notions, cultures and values that existed in the host country and then pass on to their families. Second, those migrants who are closer to their families so that they can send more money to their homes. As a result, social norms can be taken as a proxy for remittances (containing fertility preferences) which are transferred from migrant to the family. Remittances are often used for education and health services. This study uses annual data from Pakistan for the period 1975-2015 and established an adverse association between remittances and fertility rates, both in the long and short run by employing the ARDL and ECM procedure. In addition, some evidence has been found regarding the transmission of social norms in recipient countries. The study also confirms that a number of socioeconomic components, namely: average host fertility rate, female literacy rate, percent of the rural population, GDP per capita and female labor force participation, affect fertility rates.

1. INTRODUCTION

The quality of the global Diaspora has significantly increased in modern years. The Diaspora rate rose 37 percent in 15 years between 2000 and 2015. In addition, remittance movement has been intensified by the increase in the migrant and reduction fees for transmitting money. The current estimates flow around US$ 601 billion in international remittances (World Bank 2016).

In several countries, the fertility rate has declined while the rate of migration has increased. The fertility rate has been decreased for a few developing countries to rates below those needed for replacement of the immune generation. This fact has inspired different governments in developing nations to adopt policies to promote childbearing. At the same time, massive population growth in many developing states has still been a threat to

economic growth. While the fertility rate in the developing countries is generally lower in terms of children than previously, compared to developed states it remains high.

Are the rates of migration and fertility linked? The earlier studies indicate that the rate of migration and the degree of fertility may be related to each other. In addition, there is a comprehensive literature on the fertility rates of migrants. Literatures often fall into one of two regions. First, earlier literature argues that immigrants represent the fertility preferences prevailing in the home region. Therefore, only the next generation takes place according to the destination country's fertility rate.

Several research on the essence of migrants ' fertility have been performed. Those family members who have left behind in the country of destination, so what happens to their fertility activities? (Fargues P, 2007) argues that those migrants who stay in the host countries follow their ideas of fertility in the host country and then move them to their home countries. Therefore, countries in which migrants migrate to a larger degree may find the fertility rate of the destination and the countries that receive migrants converge, but convergence may vary for each of the developing countries as the migrants ' preference for the host country may not be the same. In addition, migrants can have strong associations with the country of origin, as contrasted with other destination countries, in few host countries. The social transfer from the destination to receiving state is projected to be massive if there is a strong connection between immigrants and recipient countries.

Workers' remittances measure the foundation of the migrants-household relationship back home. These migrants are rationally more willing to transfer money back to their homes and are too close to their relatives' country of origin. As a result, financial remittances can be used to calculate social remittances. (Levit, 1998) reverse social transfers as thoughts and behavioral expectations from countries of destination for home.

Thus migrants not only send money from their host to their receiving countries, but also pass the expectations and standards of conduct to their home countries. Monetary sums may be appropriate indexation of social funds. If this is the case since remittances indicate the connection between the Diaspora and families. Due to persistent increase in remittances the fertility rate of home country transfer from high to low. It therefore reveals the inverse association between the fertility rate of the country of origin and the wages of workers.

This concept is shown irrespective of the purpose of the remittance. There has been a plethora of arguments about remittances in which the migrant's prime motive is to transfer their money back home. Furthermore, the nexus of literature debates that migrants always take care of their families because of their altruistic nature. To that end, migrants are remitting money to their families to improve their standard of living. Further literature argues that, for example, there are some grounds for remitting money to invest in the country of origin. All these cases of remittances indicate the attachment of migrants to the recipient country.

This work investigates the effect of remittances on Pakistan's fertility rate. In addition, the presence of a correlation between fertility and migration also has a range of other factors that lead us to think about the connection between remittances and fertility rates. Initially, many recipient families have more children (especially rural families) and consider them to be an investment because they consider them to be potential recipients. In spite of this, earlier studies have suggested that a significant part of the remittance money is spent on health services, i.e. contraceptives and other drugs that may eventually reduce newborns. In fact, there is a plethora of literature that supports the idea that remittances can improve the children's schooling in the family. As (Cleland, 2003) states, schooling has been often the leading demographic variable. As a result, remittances can affect the recipient country's literacy level and consequently the rate of fertility.

In Pakistan, there has been considerable interest among researchers in the large number of sending campaigns in the past few decades. Some researchers (Amjad, 1986; Kozel and Alderman, 1990; Adams, 1998; Arif, 1999; Iqbal and Sattar, 2005; and Khalid Al, 2012) considered the impact of growth and development to be both micro and macro-levels. The systematic conclusion of the literature is that remittances have a direct effect

on Pakistan's economic growth. Nevertheless, there is a lack of research on the effect of remittances on the Pakistan's fertility rate Thus, the purpose of this study is to fill this gap.

2. THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

This research sets out the additional intuition behind the connection between remittances and fertility rates and argues in relation to related studies in this chapter. In order to develop this relationship, construct a model for which the author assumes that FER shows the fertility rate in Pakistan that REM represents remittances and that X is a cluster of other factors. Therefore, the equation can be written as it is.

$$FER = f(REM, X) \qquad\qquad (1)$$

Remittances demonstrate the relationship between members of the family and migrants. It is a social measure, a higher inflow of remittances, which means that there is a stronger link between migrants and family members as a result of the large effect of migrants on their family members. It essentially involves recommendations on the total number of children to be taken. A plethora of notions among migrants, typically living in a country where the rate of fertility is small, so it is predicted that the fertility of the remaining family members will converge to the level of fertility that occurs in the country of destination.

In addition, as discussed earlier, transfer of remittances is typically used for heath costs that may be included in such drugs, such as contraceptive pills, which may minimize the fertility rate. For example, (Adams, 1998) taking time series data from Guatemala, discovers that those members who are receiving families spend a lot of money on health as opposed to other families, and the same result is also seen in the context of Mexico (Valero-Gil, 2008) and (Amuedo-Dorantes *et al.*, 2007).

Furthermore, there are several literatures that support the ideas that the inflow of funds could improve children's education. Household budget restrictions can be addressed through the inflow of remittances and families have enough money to send their children to school. Due to additional income, the demand for child labor can be reduced and remittances certainly want their children to attend school. Let us consider remittances as an intergenerational process, so that those who move to other countries may think that they will retire in the country of origin and that their children will help them economically at a grownup age. For example, one unambiguous outcome can be established (Edwards and Ureta, 2003). Which determines that the remittances are directly related to school retention. There is a significant impact on the school retention of remittances as compared to other sources of family income. For example, (Lu and Treiman, 2007) the same results have been found in their study of blacks in South Africa.

Another point of view is that remittances can be seen as a source of unemployed workers. On the contrary, raising the rate of pay (in general the rate of pay of women) appreciates the cost of giving up work and spending time and leisure time. In addition, the demand for children may be raised by remittances. If, as a result, a child is deemed to be a typical good, it will directly increase the child's demand for non-labor income.

The main aim of this paper is to establish a link between remittances and rates of fertility in Pakistan. There were a few articles that speculated about the same notion as ours. For example, (Fargues, 2007) takes time series data and discovers that the inverse relationship between morocco and turkey births in the other hand has a positive correlation in remittances in Egypt.

(Beine *et al.*, 2008) examine the relationship between fertility rates and migration. In addition, we concentrate on the impact of the standard of living in the country of destination on the level of fertility in the receiving country. They also successfully evaluated the suggestion that fertility rates often travel from home to host countries through remittances. Throughout their analysis, remittances are considered to be an important part

of non-labor income. In addition, in order to measure the relation between the migrant and the household, remittances are considered to be important. In fact, the scale of the remittances is not an important part of it. This study emphasizes the function of remittances in the transfer of notions of migration to the community

In general, the proportion of rural population areas, the female labor force participation rate, the average host fertility rate of the top ten countries[1], the female literacy rate and GDP per capita are to be reviewed.

The rate of fertility in urban areas is lower than in rural areas, which means that it is directly related to the proportion of rural population and the fertility rate (UN, 1986). Anticipating that female labor force participation and fertility rates are inversely related, as if female labor force participation would result in higher opportunity costs, thus reducing the rate of fertility (Yamada and Yamada, 1984). Thus (Docquier, 2004) and (Jones & Tertilt, 2008) expect that per capita income and fertility levels are inversely related to each other, as higher per capita income usually results in a low rate of fertility. The proportion of migration as a population factor and the rate of fertility relationship is ambiguous. Migrants generally travel from high to low fertility rate nations and it possesses some time to set the degree of fertility of the destination nations. Nevertheless, the process of moving people from one location to another implies a destructive activity that temporarily decreases fertility.

3. DATA AND METHODOLOGY

The researcher used the Auto Regressive Distributed Lag (ARDL) and an Error Correlation Model (ECM) to evaluate the long and the short run interaction of variables. ARDL approach is perfect for mix integration form, i.e. I(0) and I(1), Pesaran (1997). This analysis, called secondary data, takes all information from a variety of sources, such as: World Bank Data (WDI), Pakistan Economic Survey (PES) and the Statistical Manual. The following variables include: home fertility rate, host fertility rate, remittances, per capita income, rural population, female literacy rate and female labor force participation.

There are a number of key issues with regard to remittance information, especially in developing countries such as Pakistan. Next, migrants send remittances either by Hundi or by hand. Second, if the person so sends income to their household through informal straits, it will be difficult for government officials to monitor the share of the remittances. So that's how to rising these problems. Author used data on the inflow of remittances and the proportion of GDP. As a result, the fertility rate is determined by the number of children per female. In addition, some other key factors have also been included, such as the average fertility rate of the top ten of the host countries, most of which are Pakistani and send remittances to their households, the Logarithm of the rural population, the female participation rate in the overall workforce, the female literacy rate and the log of per capita income. The annual data for Pakistan from 1975 to 2015 were used in this analysis. Consequently, following the choice of the parameter described above in equation 1. So the role of Pakistan is to define the fertility rate in the following way.

$$FER = f(REM, X) \qquad (2)$$

Where FER is the home fertility rate, f is the function of REM and X. REM reflects remittances and X indicates the following variables: AHF, RP, FLP, GPC and FLR average host fertility rate, rural population, female labor force participation, GDP per capita and female literacy rate. The following model describes the ARDL co-integration process.

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[1]Usa, U.K, Canada, Germany, Uae, Ksa, Oman, Kuwait, Bahrain, Qatar

$$\Delta FER_t = \beta_o + \beta_{1i} \sum_{i=1}^{q} \Delta FER_{t-1} + \beta_{2i} \sum_{i=0}^{q} \Delta REM_{t-1} + \beta_{3i} \sum_{i=0}^{q} \Delta X_{i(t-1)} + \beta_4 FER_{t-1}$$
$$+ \beta_5 REM_{t-1} \qquad + \beta_6 X_{i(t-1)} + U_t \quad \dots \quad (3)$$

After the existence of the long run relationship among the variables the error correction model of equation four is given below.

$$\Delta FER_t = \beta_o + \beta_{1i} \sum_{i=1}^{q} \Delta FER_{t-1} + \beta_{2i} \sum_{i=0}^{q} \Delta REM_{t-1} + \beta_{3i} \sum_{i=0}^{q} \Delta X_{i(t-1)} + \lambda EC_{t-1} \quad (4)$$

Where optimal lag length is represented by q in equation four, EC stand for error correction term and λ indicates the speed of adjustment reverse to long run equilibrium following a short run shock.

4. RESULT ANALYSIS

This segment will be conducted to observe the correlation of fertility rates not only with remittances, but will also include other key factors such as: average host fertility rate, rural population, female labor force participation, GDP per capita and female literacy rate. The descriptive statistics for all variables are shown in Table **1** below.

Table 1. Descriptive Statistics.

Variable	Minimum	Maximum	Mean	St. Deviation
FR	2.6	6.61	5.05	1.36
REM	1.45	10.25	5.15	2.24
AHF	1.98	4.64	3.13	0.92
RP	61.24	73.6	67.99	3.38
FLP	7.29	24.11	15.18	5.17
GPC	165.59	1316.98	560.13	333.12
FLR	14	49	29.91	11.9

Source: Author calculation by E. Views software

The strength of the relationship between the variables is shown in Table **2** below. The result in the correlation matrix indicates that the variables remittances, GDP per capita (GPC) and Female labor force participation (FLP) are negatively associated with fertility rate and the rest of the variables has positively interrelated with fertility rate.

Table 2. Correlation matrix results.

Variable	FR	REM	AHF	RP	FLP	GPC	FLR
FR	1						
REM	-0.18	1					
AHF	0.98	0.33	1				
RP	0.98	0.18	0.96	1			
FLP	-0.99	-0.23	-0.99	-0.97	1		
GPC	-0.95	-0.06	-0.92	-0.98	0.95	1	
FLR	0.96	-0.94	-0.94	-0.94	0.94	0.94	1

Source: Author calculation by E. Views software

Before applying ADRL method to co-integration, stationary of variables are checked by the unit root test. Table **3** the results of ADF at level and at first difference with and without intercepts. According to the results of ADF test all the variables are stationary at first difference. The fertility rate is stationary at the five percent level of significance and remaining are stationary are one percent level of significance this enables us to apply ARDL Model.

Table 3. Unit root results by ADF-Test.

Variable	At Level	At Difference
FR	-2.53	-2.86*
REM	-1.53	-5.92*
AHF	0.8	-5.53*
RP	0.95	-5.01*
FLP	-2.04	-5.67*
GPC	-0.04	-5.31*
FLR	-2.41	-6.30*

*Represent Significant at 1% and ** reprsent significant at 5%

(Bahmani *et al*., 2002) stated that the long run relationships are sensitive to lag length in the model, the variables are integrated of order one. Thus, in order to get short and long term association among variables FR, REM, AHF, RP, FLP, GPC and FLR by using two step ARDL cointegration. Table **4** shows the results of the lag length criteria. The lag length is four by means of AIC (Akaike Information Criteria), SBC (Schwartz Criteria) and HQ (Hanan Quinn is acquired by unrestricted VAR (Vector Autoregressive).

Table 4. Lag length criteria results.

Order of Lag	AIC	SBC	HQ
K = 0	23.961	24.266	24.07
K = 1	8.745	11.184	9.605
K = 2	4.614	9.186	6.226
K = 3	1.602	8.307	3.966
K = 4	-8.080*	0.758*	-4.964*

Table **5** shows the results of Bound test. This result provides evidence that there exists long run association among variables. The value of F-Statistics is 19.36, which is more than the upper and lower bound (3.99 and 2.88) of F-Statistics at the one percent level of significance. Thus, it will reject the null hypothesis that there is no long run relationship among variables.

Table 5. Results of bound test.

Test Statistics	Value	
F-Statistics	19.357	6
Critical value bounds		
Significance	Lower Bound	Upper Bound
10%	1.99	2.94
5%	2.27	3.28
2.50%	2.55	3.61
1%	2.88	3.99

Table 6. Results of long run Coefficients by using ARDL Approach.

Dependent variable FR: ARDL (1,0,0,1,1,0,1)			
Variable	Co-efficient	t-Statistics	P-value
REM	-0.0817	-3.1487	0.0037
AHF	2.2674	4.5847	0.0001
RP	2.7257	1.9581	0.0596
FLP	-0.0585	-0.6030	0.5511
GPC	-0.0200	-0.2119	0.8336
FLR	-1.1866	-3.8176	0.0006

Table **6** presents the long run relationship of the selected ARDL model, taking FR as the dependent variable. The result reveals that a remittance (REM) is the most significant factor that affect fertility rate in Pakistan. The coefficient of REM (-0.082) shows that a 1%increase in REM, it directly triggers to 0.082% decrease in fertility rates in the long run. Moreover, as the remittances increase, so the families in recipient countries spent some portion of remittances on health services such as contraceptive pills as mentioned in section 2. AHF (Average Home Fertility) is another significant factor of fertility rate in Pakistan; AHF shows significant at5% significance level. The average host fertility rate (AHF) coefficient is 2.267 which indicates that a 1% increase in AHF leads to more than two percent increase in fertility rates in the long run. It can observe from the history that the migrants move to those countries where fertility rates are lower than the home country. Consequently, migrant adopts the norms of host country fertility and later migrant transmits those living standard and values back to the home country, however, this is depends on the relationship of the migrant with the family back home. As a result, domestic fertility rates converge to host fertility rate as expected. Also, rural population (RP) has a positively significant impact on in Pakistan's fertility rate at 5% significance level. The rural population (RP) is 2.72 which shows a 1% increase in RP tend to increase by 2.73 percent in fertility rate. In general, most of the studies confirm that the rural fertility rates are higher as compared with urban areas. Further, the participation of female labor force (FLP) reveals an inverse connection with fertility. As mentioned earlier, if female participation increase in work force, so there will be a higher chance of fertility level seems to decrease. The GDP per capita (GPC) is negatively impact of home fertility rate, but not significant in the long run. The negative relation means that, if increases in GDP per capita (GPC) consequently, it directly

contributes to reduce the fertility level in Pakistan. The reason behind that, individual's living standard become high, so they may well not afford one more children because more children become expensive. The female literacy has high negatively significant impact on fertility in the long term. So, the coefficient of FLR is -1.187 which indicates that 1% percent increase in this variable it tends to decrease by 1.187% in Pakistan's fertility rate. As access of formal education of female is increasing so the fertility rate tends to decrease because educated female become more skilled so the opportunity cost of bearing children is relatively high. Consequently, it makes the cause to decrease the fertility rate.

Table 7. Results of short run Coefficients by using ARDL Approach.

Dependent variable D(INV): ARDL (1,0,0,1,1,0,1)			
Variable	**Co-efficient**	**t-Statistics**	**P-value**
D(REM)	-0.0261	-2.8932	0.0070
D(AHF)	0.5795	5.0701	0.0000
D(RP)	4.6738	8.9232	0.0000
D(FLP)	-0.0313	-1.4962	0.1450
D(GPC)	-0.0254	-0.9155	0.3672
D(FLR)	0.0333	0.3623	0.7197
ECM(-1)	-0.2634	-6.9974	0.0000

Table **7** indicates the outcomes of short run coefficients of variable of error correlation of the selected ARDL model. Coefficients of variables with "D" show the short term elasticities. Further, the estimated Error correction model ECM (-1) is highly significant at the 1% significance level and the value of this coefficient is -0.263 as exhibited in Table **7** below. Further, estimated ECM(-1) shows the speed of adjustment toward long run equilibrium is 26.33%, which means that in long run overall the system gets back to equilibrium annually at a speed of 26.33%. The remittances (REM) coefficient is crucial variables and its highly significant impact on fertility rate in the short run. The coefficient of REM -0.026 tells that one percent increase in REM goes down 0.026 percent in fertility rate. The short run coefficients of AHF and RP are highly significant at 1%. This tells that in Pakistan AHF and RP are crucial factors of FER in the short run also. They both have a positive sign as expected one percent increase in AHF and RP leads to increase 0.579 and 4.674 percent in fertility rate. FLP and GPC negatively correlated with fertility rate and insignificant in the short run. The reason for that is because in short run female has the opportunity to engage in work and due to low income they want more children's because more children today more income in the future they think the children are their investment. The coefficient of FLR is insignificant in the short term because education is a long term process. In the long run by educating and giving awareness female can to know about low fertility methods and techniques. Durbin Watson value 1.95 indicates that there is no autocorrelation.

The results of LM and HSK are shown in Table **8**. The probability value of F-Statistics of LM test is 0.82 which is greater than 0.05 taking lag length four. So, the result shows that null hypothesis accepted which indicates that there is no serial correlation between the variable. This indicates that there is no serial correlation between the variables. The probability value of HSK test F-Statistics is 0.17 which is greater than 0.05. Thus, null hypothesis accepted that shows there is no Heteroscedasticity. This indicates that there is no Heteroscedasticity problem.

Table 8. Results of LM and HSK test.

Breusch-Godfrey Serial Correlation LM Test:			
F-Statistic	0.3796	Prob. F(4,26)	0.8211
Obs* R-squared	2.2073	Prob. Chi-Square(4)	0.6977
Heteroskedasticity Test: Breusch-pagan-Godfrey			
F-Statistic	1.5613	Prob. F(9,30)	0.1723
Obs* R-squared	12.7595	Prob. Chi-Square(9)	0.1738

The Figure **1** below give CUSUM (Cumulative Sum of Recursive Residuals) test technique for the stability of ARDL framework, this estimation procedure was presented by Brown *et al*. (1975). Author, applied this CUSUM technique to check stability of ARDL model based on ECM model. Our model is structurally stable because the plots blue line is within the critical bound value at the five percent level of significance, this gives us clue that our ARDL model is stable.

Figure 1: CUSUM test Plot
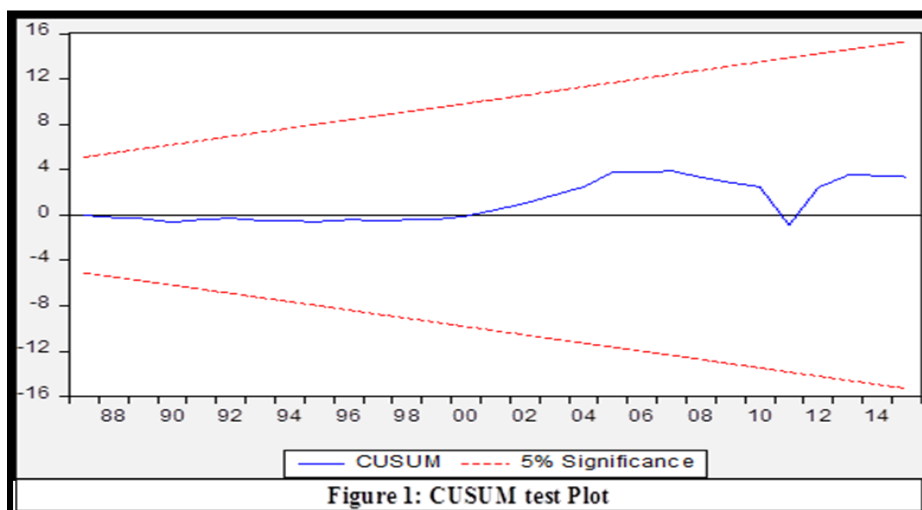
5. CONCLUSION

This study uses time series data for Pakistan to analyze the link between remittance and fertility rates. There is a cluster of remittance and development research, but no studies on remittances and fertility rates. That's why this study was trying to fill this void. The researcher used the basic ARDL estimation technique. In addition, they have an inverse correlation, both long-term and short-term with workers' remittances and fertility rates. This finding confirms the hypothesis that migration from Pakistan to countries with low fertility rates is taking place. Migrants do not only send remittances in terms of money back to the family, they also transfer norms, culture and ethics from the destination to recipient countries. The association between the household and the migrant rely upon on its strength. Remittance is known to be a social predictor. Remittance raises spending on health and education, indicating lower fertility. The host fertility rate also effect on fertility rate of Pakistan. as mentioned earlier about incorporating top ten host countries fertility[2], from where 90% of the

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[2]KSA (27%), UAE (22%), USA (18%), UK (12%), GCC (11%) and Other (10%)

total remittance sent to Pakistan. The outcomes indicate that there is a direct association that supports the idea that there is a shift from migrant norms to home norms. Pakistan's fertility rate is declining as compared to decades ago, but still high as compared to developed countries. The fertility of Pakistan and host countries converges, as shown by short-term tests.

Female literacy rate and fertility rate are inversely related, both in the long and short term, and negligible. Educated women are becoming more professional, thereby increasing the cost of childbearing opportunities so that women prefer to have childbearing, other-way literacy effects on fertility rates that are more educated means more informed about medical care and contraceptives so that the fertility rate decreases, but in the event that Pakistan's female literacy is small, that is why most of them are unaware of population reduction. The rural population has a positive effect on long-term and short-term fertility due to uneducated people who are not aware of medical care and contraceptives, while the other reason for high fertility is that children are used as a resource for the future. In addition, female labor force participation has a negative effect, but per capita income also has a negative effect on fertility, because female participation in work decreases, so that they have less time to bear children because the cost of bearing children is high.

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